



(12) **United States Patent**  
**Magleby et al.**

(10) **Patent No.:** **US 9,157,497 B1**  
(45) **Date of Patent:** **Oct. 13, 2015**

(54) **LAMINA EMERGENT TORSIONAL JOINT  
AND RELATED METHODS**

(75) Inventors: **Spencer P. Magleby**, Provo, UT (US);  
**Joseph O. Jacobsen**, Pleasant Grove,  
UT (US); **Larry L. Howell**, Orem, UT  
(US)

(73) Assignee: **Brigham Young University**, Provo, UT  
(US)

(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **12/916,110**

(22) Filed: **Oct. 29, 2010**

#### Related U.S. Application Data

(60) Provisional application No. 61/280,230, filed on Oct.  
30, 2009.

(51) **Int. Cl.**  
**F16F 1/02** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **F16F 1/027** (2013.01)

(58) **Field of Classification Search**  
USPC ..... 403/291, 220, 120, 329, 52; 16/225;  
267/154, 158–161, 163, 164  
See application file for complete search history.

(56) **References Cited**

#### U.S. PATENT DOCUMENTS

3,945,053	A	3/1976	Hillberry et al.
4,267,608	A	5/1981	Bora, Jr.
4,445,635	A	5/1984	Barr
5,405,408	A	4/1995	Pitkin
5,415,661	A	5/1995	Holmes
5,733,285	A	3/1998	Errico

5,772,661	A	6/1998	Michelson
5,964,760	A	10/1999	Richelsoph
6,045,552	A	4/2000	Zucherman et al.
6,355,040	B1	3/2002	Richelsoph
6,379,354	B1	4/2002	Rogozinski
6,440,169	B1	8/2002	Elberg et al.
6,527,804	B1	3/2003	Gauchet et al.
6,540,785	B1	4/2003	Gill et al.
6,572,653	B1	6/2003	Simonson
6,579,320	B1	6/2003	Gauchet et al.
6,610,093	B1	8/2003	Pisharodi

(Continued)

#### FOREIGN PATENT DOCUMENTS

KR	1020050080493	A	8/2005
KR	1020060113318	A	11/2006

(Continued)

#### OTHER PUBLICATIONS

Jeanneau et al.; “A Compliant Rolling Contact Joint and its Appli-  
cation in a 3-DOF Planar Parallel Mechanism with Kinematic Analy-  
sis”; Proceedings of DETC’04, ASME 2004 Design Engineering  
Technical Conferences and Computers and Information in Engineer-  
ing Conference; Sep. 28-Oct. 2, 2004; Salt Lake City, Utah USA.  
DETC2004-57264, 2004by ASME.

(Continued)

*Primary Examiner* — Daniel Wiley

(74) *Attorney, Agent, or Firm* — Thorpe North & Western,  
LLP

(57) **ABSTRACT**

A torsional joint assembly formed from a substantially planar  
material sheet comprises a plurality of contiguous segments.  
The contiguous segments include at least two, substantially  
parallel hinge segments, each being coupleable to a loading  
structure; and at least a first connecting element connecting  
the hinge segments one to another, the connecting element  
extending substantially orthogonally to the hinge segments.

**16 Claims, 5 Drawing Sheets**

